Ground Network
Earth Science Sub-Network
Augmentation

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Goals

- Migration of Earth Science Missions to Ka-band –[25.5-27 GHz]
- Higher data rate telemetry

Implementation- Preliminary Plan

- Ka band services offer down link data rates in the Gbps range and alleviate spectrum crowding
- Three high latitude stations provide sub-net robustness and flexibility
  - Scandinavia
  - Alaska
  - Antarctica (McMurdo)
- Disruption Tolerant Networking protocols help mitigate weather or other link outages

Current Status

- NASA has baselined a high latitude Ka-band sub-net in it's future space communications architecture
- Path finder implementation of 5.4 meter system initial operation in 2014
- Full sub-net implementation could be accelerated to enable earth science initiatives

Investigating Deploying 12m Antennas:
Data Rate ~ 1 Gbps

- Assumed Parameters
  - Transmitter output power is 2.5 watts
  - Spacecraft antenna gain is 43 DBI
  - Altitude is 800KM
  - Max range is 1242km
  - Space loss is187 db
  - Ground antenna size is 12M
  - Ground antenna efficiency is 65%
  - Ground antenna gain is 68DB
  - Ground antenna g/t is 43.5 DB/K

Back of the envelope calculation results:

"Suffice it to say that these specs will almost certainly change, but there is sufficient margin that I believe that it is a safe bet to say that with these 12 meter antennas we can easily achieve data rates in excess of 1 GB per second for spacecraft in LEO orbits including polar orbits."